nite quantities of NaOH added and the danger of adding either too little or too much of the NaOH was ever present.

The detailed technic of the new method, which in the hands of the author has given very satisfactory results in the preparation of a large number of doses, is as follows:

A glass-stoppered, wide-mouth, 30 cc. flask is employed, of a depth that should the preparation be administered intramuscularly, will permit the hypodermic needle used to reach its bottom. A wide mouth prevents any "606" adhering to the sides of the neck when emptying the contents of the ampule into the flask. It is convenient to have a flask of such depth that should permit the needle of the syrings used to take up the last portions of the preparation directly from the flask. Boil about 10 cc. of distilled water in a test tube and pour the boiling water into the flask. The Salvarsan is next dusted upon the water and dissolved by vigorous agitation for a few seconds. To this aqueous solution of the "606" is added the required quantity of the standard solution of NaOH (3.6%) i. e., one cc. for each .1 gm. of "606" employed, if the clear alkaline solution is desired or .5 cc. of the standard solution of NaOH for each .1 gm. of "606" employed, if the neutral suspension of the precipitated base is desired. The flask is again well shaken after the addition of the NaOH and the preparation is next made up to the proper quantity with normal salt solution, usually 20 cc. if to be injected intramuscularly and 100 to 250 cc. if intravenously. Of course, at all times must the most aseptic precautions be observed and all solutions and apparatus sterilized before use.

VARIATIONS IN THE TONICITY OF THE ABDOMINAL MUSCULATURE AND THEIR SIGNIFICANCE.*

By J. L. LOHSE, M. D., Oakland.

The selection of this subject for a paper was determined upon by the conviction that a great and unwarranted lack of consideration has been given to one of the most important systems of our body, —namely the muscular system; and that by this neglect much is overlooked that has a direct bearing upon the prevention of disorders as well as upon their correction when once they are an established condition. Our failure to appreciate its importance has left open a large field which is responsible for the founding of many large schools for the teaching of irregular practitioners,— mainly the osteopathic. Surely there has been a call for these schools for, as has been pointed out by Alexander Bryce, of Glasgow, if as many as twelve osteopathic schools in the United States can be founded and prosper and their graduates be so successful that others of intelligence take up the study and practice, there is something greatly remiss in the practice of the regular school or lacking in its appreciation of the causes of disturbances in the general health that reside in the musculature. This is not intended as an argument in justification of the right for these schools to exist, but I do wish to lay stress upon the fact that it is now a considerable number of years since the first of them was founded, and that, if the principles underlying their practice were *wholly* fallacious, their number would be on the decrease, their prosperity on the wane, and their graduates find their practice more and more limited. As a matter of fact, the reverse holds true. That such institutions should thrive is sufficient evidence in my mind that conditions leading to a disturbance of the function of the musculature and the bearing these disturbances have upon general health do not receive proper consideration.

In these days of advanced laboratory methods, we lay great significance upon the findings obtained by various examinations of the excretions and fluids of the body and are inclined to be oblivious to the mechanics of the human organism. As a result, mechano-therapy does not occupy the place in general practice that it should. Goldthwait of Boston, in an address before the Boston Medical Library, said that "the human organism resembles, in many ways, a delicately balanced machine made up of many parts, each related to the others, and that which we call perfect health is simply the proper correlation of all these many parts." The muscular system plays a great part in the intricacies of the human machine, and any condition leading to a disturbance in its function is far-reaching in its effect, even to an impairment of the mental powers of the individual concerned.

Under normal conditions of health and development of mind and body, the muscles are found in a state of tonicity that is physiological; the poise of the body in standing, walking, running, and in every movement exemplifies gracefulness, an accurate co-ordination of muscular action, a minimal expenditure of energy, and a performance of the functions of all the viscera to their best advantage. This normal state of contractility means that no muscle, or group of muscles, is being subjected to undue strain when the individual is standing at ease. The head is held erect, the shoulders are thrown back, the abdomen is flat, and the spine presents no lateral deviation from the perpendicular, but has a slight dorsal curvature with convexity posterior and a compensatory lumbar curvature with convexity anterior. The pelvis is tilted forward so that the anterior aspect of the fifth lumbar vertebra is on a plane just posterior to the center of the hip joint. The iliopsoas muscle, by its normal state of contractility, assists in maintaining the pelvis in this position. In this attitude, opposing or antagonistic muscles are perfectly balanced, so that there is no unnecessary expenditure of energy in the one while the other is in a state of relaxation. Because of their ready adaptability to every action that they are called upon to perform, there is a perfection of grace that is not acquired otherwise, and complications in the actions of muscles are reduced to a minimum.

Probably one of the most important problems to be considered in this subject is the relationship that exists between the functions of many of the viscera

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and the state of tonicity of the musculature. The correct attitude that an evenly balanced musculature implies provides for such dimensions of the thoracic cavity that the lungs are permitted to fill to their utmost capacity on each inspiration. This perfect aeration is a guardian of the health of the lungs and permits of a thorough oxidation of the blood with the least possible effort on the part of the circulatory apparatus. The maximal anteroposterior diameter permits of the greatest freedom in the action of the heart, whether under conditions of rest or great strain; and for this reason, not only are the resources of the heart muscles greatly conserved, but every other structure is insured a more nearly normal supply of blood.

A consideration of the abdominal viscera in this regard necessitates the explanation of a few anatomical facts for here we have a number of soft and hollow organs enclosed within a cavity, the walls of which are for the most part composed of soft structures. The knowledge of these facts is a great aid in arriving at a better understanding of the factors concerned in the support and maintenance of the viscera in their normal position. With the body in the correct attitude the normal curvature of the lumbar spine brings the surface of the fourth and fifth lumbar vertebrae very close to the anterior abdominal wall, so that the distance between them is only one-third the thickness of the body; instead of finding the deep grooves on each side of the vertebrae as is present opposite those higher up, the psoas and quadratus lumborum muscles with the retroperitoneal fat so completely fill them that the surface of the abdominal wall posteriorly is practically level. From the level of the fourth lumbar vertebra the spine inclines sharply upward and backward, and coincident with this the lateral vertebral spaces rapidly become much deeper. This, as the upper part of the cavity is reached, accounts for a marked difference in its depth and, with an increase in this dimension, the other dimensions are proportionately greater. In this spacious upper half are found the viscera with ample space for their support and performance of functions to the best advantage, while below, in that part with the greatly shortened diameters, are found practically only the coils of the small intestine.

The posterior abdominal wall by this conformation assists so greatly in the support of the viscera that its importance in this regard can only be fully appreciated by the study of frozen sections. By these we see that the kidneys lying in the deep lateral vertebral grooves, from approximately the fourth lumbar to the twelfth dorsal vertebra, are on a plane considerably posterior to that of the anterior surface of the body of the fifth lumbar vertebra. Their upper poles are on a plane even more posterior than the lower, and their ventral surfaces do not reach as far forward as the anterior surface of the body of the twelfth dorsal vertebra. By this we have explained a factor that, supplemented by the presence of the retroperitoneal pad of fat and renal fascia gives ample support for the kidneys, provided the tonus of the abdominal muscles is physiologically normal.

The liver, by its upper surface, fits accurately into the vault of the diaphragm. Its right lobe, that constitutes the major portion, has a broad and rounded posterior surface that on transverse section is seen to represent the base of a triangle, the apex of which corresponds to the sharp anterior border. This surface corresponds to the tenth and eleventh dorsal vertebrae; and because of the dorsal curvature of the spine, is placed on a plane even more posterior than that of the kidneys. Added to the downward and forward direction of the spine in this region, there is a decided contraction of the chest wall, due to a decrease in the radius of curvature of the ninth, tenth and eleventh ribs. This gives to the shape of the space in which the liver lies the contour of a cone, the apex of which is pointed downward; and by this we have explained a factor of importance in the support of this organ.

A study of the inferior surface of the liver is interesting. The direction of its plane is *backwards* and *downwards,* which fact in itself is of great significance. It presents elevations and depressions by which it is seen that it rests upon the lower dorsal vertebrae, the crura of the diaphragm, the great vessels, the upper pole of the right kidney, the hepatic flexure of the colon, the duodenum, pylorus and stomach. Because of the rigidity of the spine supporting it posteriorly an actual descent of the liver could take place only after a primary rotation on its transverse axis. This would displace the anterior border (the apex of the wedge mentioned) downward and forward, and the posterior surface (base of the wedge) would look upward. But here we have other elements assisting in its support, namely, ligamentous structures, and the tonicity of the abdominal muscles. Of the five ligaments that are described in works on anatomy as giving it firm support, there is no one that serves so efficaciously in preventing its descent, after primary rotation has taken place, as does the vena cava inferior. A careful dissection of it will reveal the fact that its fibrous wall is intimately and inseparably connected with the supporting connective tissue structure of the liver as it passes through the fissure on its posterior surface, and also with the fibrous tissue of the crura of the diaphragm and the central tendon. The tonicity of the abdominal muscles gives the support to the soft tissues that form the bed of the liver anteriorly; and so the rotation on its transverse axis by which the anterior border may reach as low as the umbilicus is prevented. It may be mentioned here that the cases of hepatoptosis as described by some authors do not occur as the strict meaning of the word implies, but instead are cases in which the liver has merely rotated on its transverse axis.

A consideration of the position of the stomach and the relations of some of the abdominal viscera to it will show what a tremendous factor the normal tonicity of the abdominal muscles is in maintaining it in its proper position. Its fundus lies deeply placed in the left lateral vertebral groove. Prof. Cunningham, of the University of Edinburg, gave to the space that it occupies the name of "stomach chamber"; and its description is best given by quoting his own words. "When the

stomach is distended, it completely occupies this space, but when empty the transverse colon passes into it, doubling up over the stomach. The chamber presents an arched roof, an anterior wall, and an irregularly sloping floor. The roof is formed partly by the visceral surface of the left lobe of the liver, and, in the rest of its extent, by the left cupola of the diaphragm, which arches downwards, behind, and on the left to meet the floor. The floor, or 'stomach bed,' is a sloping shelf on which the under surface of the stomach rests, and by which it is supported. The bed is formed behind by the top of the left kidney, suprarenal capsule, and the gastric surface of the spleen; in front of this by the wide upper surface of the pancreas, and more anteriorly still by the transverse mesocolon, running forwards above the small intestine from the anterior edge of the pancreas to the colon, which latter completes the floor anteriorly. The anterior wall of the stomach chamber is formed by the abdominal wall between the ribs on the left and the liver on the right side."

The cecum and iliac portion of the pelvic colon lie upon shelves formed by the inward slope of the ilio-innominata, the ilio-pectineal ridges, and the promitory of the sacrum; the muscular padding provided by the psoas and the iliac vessels lying along its inner border increases the efficiency of these shelves or ledges. These positions and relations of the viscera are obtained in the individual of the normal type. Disturbances in their support and function are found in those suffering from congenital or acquired anatomical defects, and in those whom by faulty posture or by occupation have produced changes in their skeletal alignment. Errors in dress, such as the wearing of bad corsets, Reynolds & Lovett of Boston have shown, are responsible for many vague abdominal symptoms. But it may be said that there is no one factor that is so important in the general economy of the body as the normal tonicity of the musculature. By the efficiency and physiological state of contractility of the abdominal muscles we have provided that mysterious force known as intra-abdominal pressure.

A hypertonicity of the abdominal muscles is not so productive of trouble as is the state of hypotonicity. It prevails very frequently in those individuals, especially young women, who have a highly sensitive nervous constitution that keeps the musculature ever on the alert, as it were. Inflammatory conditions, or irritative lesions within the abdomen, such as chronic appendicitis, a contracted fibrous appendix, adhesions from whatever cause, the presence of calculi of the urinary or biliary systems, hyperacidity of the gastric juice, duodenal and peptic ulcers, and intestinal parasites, all produce such a state. The levator ani below, the diaphragm above, and the external and internal oblique, transversalis, and recti muscles in front and laterally are all opposing each other; and it becomes a case of the survival of the fittest. Too often it is the levator ani that becomes exhausted first. Unable to contend against its more powerful opponents its fibers relax, are overstretched, and are then unable to recover their tone. This relaxation leads to disturbances in position of the pelvic viscera with subsequent phenomena; and I believe that the relaxed perinei with displaced uteri so often found in young women who have never borne children can be accounted for in this way. Also such congenital defects as peritoneal pouchings are exaggerated and finally lead to the production of hernia. Backaches, pains in the groins, constipation, and disturbances of digestion are some of the phenomena that may occur from hypertonicity of the abdominal muscles.

Hypotonicity, or a lack of muscular efficiency, means a weakening of one of the most potent forces in the maintenance of the abdominal viscera in their relative positions. Without it, the kidneys, stomach, spleen, and liver are relieved of the pressure from below and in front and thereby find it easy to slide anteriorly off the beds on which they lie before actually descending.

There are many conditions leading to a hypotonicity of the musculature. Hard work, poor food, and living in overcrowded and poorly ventilated buildings will produce it in children along with other constitutional weaknesses. Working hand in hand with their faulty postures, and peculiar conformation of chest walls and upper abdomen, individuals of the habitus enteroptoticus type have an inefficiency of the musculature. The chronic infectious diseases, intoxications, as from mercury and arsenic, autointoxications, and some of the febrile diseases that run a prolonged course, as typhoid fever, are responsible in many cases, and also are the anemias. Prolonged overstretching of the fibers of the abdominal muscles from large intra-abdominal growths and pregnancy will oftentimes, after the condition is relieved, make it impossible for them to resume their normal tone, and these individuals, probably more than any others, are sufferers from displacements of viscera. Obesity, especially that form characterized by the deposition of immense quantities of fat in the abdominal wall is a common factor in the production of hypotonicity. By the mere weight of the fat the abdominal muscles become exhausted, lose their tone, and the displacements of viscera with all the attendant symptoms ensue. When a patient of this type complains of backache, constipation, pains in both inguinal regions and in the right side under the ribs, irritability of the bladder, flatulence and other symptoms of indigestion, no relief can be given her until the true character of her condition is appreciated.

In a few words I would like to touch upon certain features pertaining to the muscles of the back. In the deepest layers of muscles of the back and posterior aspect of the neck are groups of muscles that, by their origin and insertion, have a direct action upon the ribs and vertebrae to which they are attached. I refer especially to the units constituting the erector spinae, the trachelo-mastoid, complexus, rotatores spinae, interspinales, and the intertransversales. It is recognized that these muscles, singly or in groups, may go into a state of spasticity, that by its continuance

becomes more or less chronic. The cause may be from violence, exposure, posture, occupation, sleeping on badly constructed mattresses, or from irritation to the nerves supplying them, whether peripheral, central, or reflex. By a persistence of these contractures, or state of hypertonicity, the points of attachment of these muscles become approximated. This approximation means that there is a disturbance in the relation between the articulating surfaces of the bones involved, or in the proper alignment of that part of the skeleton. Opposing groups of muscles become exhausted and finally relax from the continued stretching, thereby subjecting the ligamentous structures to continuous and undue strain. As a consequence the individual is easily fatigued, and suffers from pain of a greater or less degree.

In concluding I will say that I believe many patients, who go the rounds from physician to physician without getting relief, are sufferers from some disturbance in the mechanics of their bodies, and that these disturbances most commonly reside in the musculature. The conditions that are responsible for them should always be borne in mind when taking the history of a patient. The predisposing influence that faulty postures, whether from habit, or occupation, the wearing of bad corsets and bad shoes, chronic infectious diseases, and disturbances in metabolism have in the causation of abnormal variations in the tonicity of the muscles, should be fully appreciated, for then I believe there will be fewer dissatisfied patients, quicker and more permanent cures, besides a much smaller patronage given to practitioners of the "bone-setter" type.

TREATMENT OF VASCULAR NAEVI WITH CARBON DIOXIDE SNOW.*

By G. H. MIZE, M. D., San Francisco.

It is not my desire this evening to furnish an exhaustive treatise on carbon dioxide snow and the microscopical changes resulting in the tissues from its use, but to present to you the salient points in the preparation and the clinical utilization thereof.

It might be well to present a classification of vascular nevi in order to better understand the subsequent description of the methods employed. I know of no better clinical classification than that adopted by Dr. Friedlander in an article on the subject in the October number of the STATE JOURNAL. It is as follows:

"First—Flat Nevi.

Second—Hypertrophic Nevi.

Third—Angioma Cavernosa.

The flat nevi are subdivided into *naevus araneus* and *naevus flammeus,* the first being commonly called "spider naevus," consisting of a central capillary vessel with small aborescent branches and normal skin between the branches. *Naevus flammeus* consists of a plexus of superficial dilated capillary vessels which are so closely approximated as to show no normal skin between. This form of nevus is what is popularly known as "portwine mark."

The hypertrophic nevus consists of a well defined, elevated, often irregular mass of intercommunicating blood vessels of uniform color. The tumor tends to increase in size for a short time after birth, subsequently remaining stationary.

The angioma cavernosa is similar to the previous form with the exception that it continues to increase in size, at the expense of the surrounding tissue, for an indefinite length of time."

Various other methods have been used for the treatment of vascular nevi, but I know of no other procedure which can be so readily carried out and which produces as desirable results as freezing with carbon dioxide snow. The only other method which approaches this treatment in perfection of results is the application of radium but the cost must be taken into consideration and it must also be borne in mind that telangiectases sometimes result. The radium produces no immediate results and is difficult to keep in place for the length of time necessary, especially on a struggling child. I shall demonstrate this evening the method of preparation of the snow and I am glad to have this opportunity of presenting some of the cases treated by this method in the Dermatological clinic in this college.

The carbon dioxide is supplied as a liquid in an iron cylinder. The apparatus for collecting and compressing the snow consists primarily of a brass cylinder perforated by numerous small apertures and around this cylinder is wrapped a piece of chamois, bound on by windings of silk thread, and surrounding the whole is a perforated hard rubber sleeve. The upper end of the tube is threaded for the insertion of a reducer by which the collector is attached to the supply tank. The lower end tapers to an aperture 1 cm. in diameter. In collecting the snow the outlet of the supply tank is placed at a lower level than its base, the collecting apparatus wrapped in a towel and attached to the tank and the valve opened. A portion of the escaping fluid evaporates so rapidly that sufficient cold is produced to freeze the remaining carbon dioxide in the apparatus, into a loose snow. When the apparatus becomes filled with the snow the reducer is removed and a brass plunger with a threaded piston is inserted and screwed down until further compression is difficult. The resultant block of ice can be extracted by removing the tapering nozzle or by running hot water on the apparatus and shaking the ice from the base. The block is then shaped as desired and is ready for application.

When an extensive *naevus flammeus* is to be treated, several applications of the snow are necessary in various portions of the growth and with the cylindrical block of carbon dioxide there is apt to be overlapping of the circles treated. To obviate this difficulty Dr. Friedlander has modified the collecting apparatus so that a tapering square block of snow is obtained and with this, treatment can be approximated upon treatment without overlapping.

Before making the application it is well to clean the skin with alcohol. The block of snow is then grasped with tissue forceps and applied firmly for a variable length of time, depending upon several fac-

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